REMARKS/ARGUMENTS

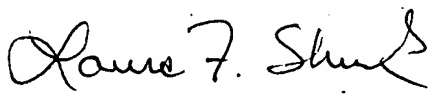
The courtesy of the Examiner in the interview of April 19, 2004 is sincerely appreciated. In accordance with the discussions of that interview, the claims have been amended. In particular, the term "calamitic" has been substituted for the term "rod-like" and a reprint of an article from Sheffield Hallam University (included herewith) describes calamitic liquid crystals as liquid crystals having rod shaped molecules. Accordingly, this term has been substituted in the claims for the term "rod-like", and has also been inserted into the specification.

In addition, specific language has been added to more clearly define the structure of the invention which distinguishes the invention from the prior art as was discussed in the interview.

It is respectfully submitted that the application is now in condition for allowance, and notice to such effect is respectfully solicited.

Respectfully submitted,

HUDAK, SHUNK & FARINE CO. LPA



Laura F. Shunk
Reg. No. 31,423

2020 First Street, Suite 307
Cuyahoga Falls, OH 44221
Telephone: (330) 535-2220
Facsimile: (330)-535-1435

ATTORNEY DOCKET NO. KENT-G

Materials Modelling Group

A Very Brief Introduction To Liquid Crystal Fluids

A liquid crystal phase, often termed a mesophase, is an intermediate phase of matter between the solid and liquid phases which can exhibit certain physical properties of both these phases, i.e. molecules can diffuse readily and viscous flow can occur (as in a liquid) but also (as in a solid) there is a degree of long range order not seen in isotropic liquids.

The unique properties of liquid crystals have found technological uses throughout the twentieth century in areas such as display technologies and data storage. Despite this, many of the properties and basic physics of liquids crystals are poorly understood. There are generally two categories of liquid crystals, these being lyotropic and thermotropic. Lyotropic liquid crystals exhibit changes in phase as a function of solute concentration whereas thermotropic liquid crystals exhibit changes in phase as a function of temperatures. Thermotropic liquid crystals are indefinateley stable at definite temperatures and pressures. The molecules found in materials known to form liquid crystal phases are also split into two groups, the most common type involving rod shaped molecules, (i.e. those with one molecular axis which is much longer than the others). Such compounds are called calamitic liquid crystals and will form the basis of this study. The second category of molecules known to form liquid crystals is that of disk shaped molecules (i.e. those with one molecular axis which is much shorter than the others). Such phases are called discotic phases. In both calamitic and discotic cases an important condition is that a considerable amount of the molecular anisotropy be reasonably rigid. The phases formed by calamitic liquid crystals can be broadly split into two categories, nematic phases and smectic phases fig~\ref {fig:phases}. In the nematic phase the molecules do not possess any long range positional ordering but do show a degree of orientational order so that their molecular long axes are preferentially pointing along a given direction, this direction is called the director. In the smectic phases, an additional positional ordering is seen, with the molecules forming well defined layers. The smectic A phase corresponds to a layered structure where the molecular centres of mass within the layers possess no long range order. Each layer within the smectic A phase can be considered as being a 2 dimensional liquid. In the smectic C phase each layer is still a 2 dimensional liquid however, the molecules within the layers are tilted with respect to the layer normal.